

Developments with Autonomous Ships

Possible Case Studies from a VTS Perspective

SUMMARY

Country	Commenced / Commencing Operations		Trial / Test Bed	
Belgium / Netherlands	-	-	Deseo	inland container vessel
	-	-	Factofour	inland container vessel
Denmark	-	-	Nellie Bly	10m Tug
Finland	-	-	Suomenlinna II	Passenger ferry
	-	-	Falco	Car Ferry
France	-	-	VN Rebel	
Japan	-	-	Sunflower Shiretoko	Car ferry
Korea	-	-	Haumgum No. 1	Mid-sized merchant ship
			Aragon XNUMX	Coast survey ship (3 tons)
			??	LNG carrier and smaller passenger crafts
Norway	Yara Birkeland	80m Container ship	ASKO	Container shuttle
	Bastø Fosen VI	Passenger ferry	-	-
Singapore	-	-	Intellitug Smart Maritime Autonomous Vessel Project MINERVA	Tug
Spain	USV Vendaval	Patrol Ship	-	-
Sweden	-	-	Candela	7 m leisure craft
USA	Mayflower	15m Trimaran	-	-
UK/USA		21-72 m -Ocean survey ships	-	-

PART 1 – COMMENCED / COMMENCING OPERATIONS

Country	Vessel	Comments	VTS Involvement	Reference/s	Rapporteur
Norway	Yara Birkeland Container ship 80m Length <ul style="list-style-type: none"> • 120 TEU • Autonomous 	<ul style="list-style-type: none"> • First voyage to commence end of 2021 • To operate within 12 nautical miles from the coast, between 3 ports in southern Norway. • Brevik VTS - Vessel needs permission from the VTS center to “use the water”, e.g sail in to the area, leave port, anchor etc. The VTS centers are authorized to set terms to a permission, e.g when to depart or what route to follow, thus organizing the traffic. 	Brevik VTS	https://edition.cnn.com/2021/08/25/world/yara-birkeland-norway-crewless-container-ship-spc-intl/index.html	Trond Ski

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Country	Vessel	Comments	VTS Involvement	Reference/s	Rapporteur
	<ul style="list-style-type: none"> Controlled remotely Crew (initial phase) 	<ul style="list-style-type: none"> Autonomy will be in stages 			
	Bastø Fosen VI Passenger ferry <ul style="list-style-type: none"> Autonomous Crew 	<ul style="list-style-type: none"> Regular passenger ferry service from Feb 2020 Have autonomous berthing capabilities Horten VTS - Vessel needs permission from the VTS center to “use the water”, e.g sail in to the area, leave port, anchor etc. The VTS centers are authorized to set terms to a permission, e.g when to depart or what route to follow, thus organizing the traffic. 	Horten VTS	https://www.kongsberg.com/maritime/about-us/news-and-media/news-archive/2020/first-adaptive-transit-on-bastofosen-vi/	
USA	Mayflower Autonomous Ship (MAS) 15 m length <ul style="list-style-type: none"> Autonomous Unmanned Solar powered 	<ul style="list-style-type: none"> Ocean science, data collection vessel Trans-Atlantic sailing planned to commemorate 400 years since original Mayflower 2020 trip Plymouth (UK) to Plymouth, Massachusetts (USA) delayed due to COVID-19 First trip commenced 15 June 2021 but abandoned due to mechanical issues Repairs made, local trials in progress Summer-Fall 2021 Cooperative effort planned with Port of Rotterdam planned during Fall 2021 trials Second trip planned for Spring 2022 	None locally, Planned effort with Rotterdam during trials	https://www.ibm.com/a-/-en/cloud/automation/mayflower-autonomous-ship	Michael Trent
US/UK	ARMADA FLEET Ocean survey vessels 21 to 78 m in length <ul style="list-style-type: none"> Autonomous Unmanned Hybrid power 	Ocean Infinity made waves in 2018 with the launch of 6 Autonomous Underwater Vehicles (AUV) from a single vessel to vastly expand ocean survey coverage. In 2021, they are launching the ARMADA FLEET, a fleet of hybrid powered, high endurance Unmanned Surface Vessels (USV) to be deployed globally and controlled remotely from centres in Southampton (UK), Austin, Texas (USA) and Singapore.	Building 3 Remote Control Centre for global control of survey vessels	Ocean Infinity Armada Fleet Building Armada	Michael Trent
Spain	USV Vendaval Patrol ship	<ul style="list-style-type: none"> Operating since 2020. Can be operated with and without crew on board. 	Port of Ceuta	http://www.puertodeceuta.com/puerto/sistema-de-	Carlos F. Salinas

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Country	Vessel	Comments	VTS Involvement	Reference/s	Rapporteur
	11 m length Remote operated Power driven vessel	<ul style="list-style-type: none"> • Safety surveillance. • Security surveillance. • Environmental monitoring. • Only operate within port limits. 		vigilancia-y-control-medioambiental-svcm-en-las-aguas-proximas-a-las-darsenas-y-muelles-del-puerto-de-ceuta/	
France	VN Rebel	<p>The VN Rebel vessel was remotely operated by satellite links from the head office of the SeaOwl group, 16 rue Rivay, 92300 levallois-perret. The ship has been remotely operated since its departure from the quay to the point located to the south-east of the Saint Mandrier prequ'ile outside the Toulon harbour and approaches. The conditions for supervising this experiment were authorized by the Maritime Prefecture of the Mediterranean.</p> <p>Trial Completed</p>	No, outside VTS supervision. In contact with the military base	https://seaowlgroup.com/s/eaowl-un-navire-tele-opere-par-satellite-pour-les-operations-subsea-en-afrique/	
	autonomous surface craft and authorization regime prerequisite for more powerful gear (autonomous vessels).	<p>The decree relating to the methods of experimentation with the navigation of autonomous or remotely controlled maritime floating devices for maritime navigation was published in the OJ of May 31, 2020: https://www.legifrance.gouv.fr/affichTexte.do;jsessionid=49684741F9CA006C753DCD6D1602E101.tplgfr22s_2?cidTexte=JORFTEXT000041938890&dateTexte=&oldAction=rechJO&categorieLien=id&idJO=JORFCONT000041938591 As a reminder, this decree was issued in application of X of article 135 of the LOM.</p> <p>It establishes a dual regime allowing the conduct of experiments with these autonomous or remotely controlled floating devices: a prior declaration regime for small devices (maritime drones), which meet the criteria established by the decree, and an authorization regime prerequisite for more powerful gear (autonomous vessels).</p> <p>Declarations and requests for authorizations are made to the maritime prefectures. In addition, it obliges the operators to communicate the results of the tests to the DAM so that the administration can use them within the framework of the preparation of the report intended for the Parliament and of the ordinance relating to autonomous ships which must make it possible to adapt the law applicable to the development of these devices. The publication of this decree unfortunately took place the day after International Drones Day (no sense of communication at DILA) but it concludes nearly 6 months of work largely carried out by Farah and whom I would particularly like to thank.</p>			

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PART 2 – TRIALS / TEST BEDS					
Country	Vessel	Comments	VTS involvement?	Reference/s	Rapporteur
Belgium / Netherlands	Deseo	The inland container vessel DESEO is sailing between Zeebrugge and Antwerp. The vessel is remotely operated from Anwerp, by SEAFAR. This is the second phase of the test. The first part was from Zeebrugge to Vlissingen. The tests are under full VTS Coverage.			Vivian Baetens
	Factofour	The inland container vessel FACTOFOUR is sailing between Hansweert (NL) and Antwerp (BE). The vessel is equipped for autonomous sailing, but at this stage they are only gathering data for the Black-Box. The tests are under full VTS Coverage.			(Joint nautical Authority)
Korea	Haumgum No. 1 Aragon XNUMX.	<ul style="list-style-type: none"> ○ Planned for end of 2021 ○ 	??	https://www.maritime-executive.com/article/hyundai-plans-first-ocean-going-autonomous-ship-voyage-by-year-s-end	Jinsu Jeon
Japan	Sunflower Shiretoko coastal car ferry	Auto-berthing and unberthing system of the Sunflower Shiretoko at the port.	??	https://www.porttechnology.org/news/mitsui-osk-lines-trial-shows-autonomous-vessel-promise/	Hideki Noguchi
Finland	Suomenlinna II Passenger ferry	Remote control trial of passenger ferry in a pre-selected area of Helsinki harbor in 2018. Operated by ABB Trial Completed	N	https://new.abb.com/marine/marine-references/suomenlinna-ii	Matti Aaltonen
	Falco Car Ferry	Remote control of car ferry in archipelago of Turku, Finland Trial Completed	N	https://www.rolls-royce.com/media/press-releases/2018/03-12-2018-rr-and-finferries-demonstrate-worlds-first-fully-autonomous-ferry.aspx	Matti Aaltonen

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		<p>One Sea is a high-profile ecosystem with a primary aim to lead the way towards an operating autonomous maritime ecosystem by 2025. The collaboration gathers together leading marine experts and is a strategic combination of top research, state-of-the-art information technology and business.</p> <p>The work began in 2016, and the aim is to create an environment suitable for autonomous ships by 2025.</p>		https://www.oneseaecosystem.net/	Olli Soininen
Netherlands	??	Harmen van Dorsser to provide info	??	??	Harmen van Dorsser
Norway, Singapore et al	No particular ships	Tests of MASS in ports and port areas	??	MASS Ports	??
Norway	ASKO Container shuttle	Autonomous container shuttle designed to carry 16 containers over the Oslo fiord (Moss-Horten). Like Yara it's to be operated by MASSTERLY, ad Wilhelmsen/Kongsberg collaboration	Horten VTS	ASKO project	Trond Ski
	Intellitug	<ul style="list-style-type: none"> • Collaboration between technology provider, Wartsila, marine services provider PSA Marine, classification society Lloyd's Register, the Technology Centre for Offshore and Marine Singapore (TCOMS) and MPA • 27m harbour tug • Designed to provide supervised autonomous control for harbour tugs • Smart navigation system and collision detection and collision avoidance capabilities verified in a defined trial area 	No	https://www.wartsila.com/intellitug?utm_source=press-release&utm_medium=org&utm_term=marine&utm_content=intellitug-project&utm_campaign=wartsila-and-psa-marine-successfully-complete-initial-sea-trials-of-smart-intellitug-ship	Chong Jia Chyuan
	Smart Maritime Autonomous Vessel	<ul style="list-style-type: none"> • Collaboration between technology provider ST Engineering Marine, tug service provider, POSH, classification society ABS, telecommunication provider M1 and MPA • 30.5m harbour tug • Designed to have autonomous capabilities alongside a shore command centre with remote control capabilities 	No	https://onward.stengg.com/2020/04/29/sea-trials-for-autonomous-tugs/	Chong Jia Chyuan

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		<ul style="list-style-type: none"> Autonomous navigation capabilities, collision detection and collision avoidance capabilities, and remote control capabilities verified in a defined trial area 			
	Project MINERVA	<ul style="list-style-type: none"> Collaboration between Keppel Offshore and Marine, ABB, ABS, TCOMS and MPA 32m harbour tug First phase of testing in the sanitised trial area which verified remote control capabilities Next upcoming phase will test autonomous navigation and collision detection and collision avoidance capabilities in a defined trial area 	No	https://new.abb.com/news/detail/39090/abb-to-bring-autonomous-technology-to-the-port-of-singapore	Chong Jia Chyuan
Sweden	Candela - 7 m leisure craft and 25-30 pax ship Electric foil boat/ship	Innovative ships designer/producer planning to scale up 7 m leisure craft design to a 25-30 pax commuter ship in Stockholm, Oslo and San Francisco. Candela has been granted financing from the Swedish Government and the project is ongoing.	??	Candela Speedboats	??
	Electric & autonomous road ferries	<p>Electric driven (fossil free) road ferries for fully autonomous transit and designed to carry 60 cars.</p> <p>Route in the Stockholm archipelago (Ljusteröleden and Vaxholmsleden).</p> <p>Test project started.</p> <p>Delivery of first road ferry planned 2022/23.</p> <p>Run by Swedish Transport Administration</p>	??	https://www.trafikverket.se/farjerederiet/om-farjerederiet/nyheter---farjerederiet/Nyheter/2020/fyra-nya-elfarjor-till-stockholms-skargard/ (So far only in Swedish)	??
Denmark	Nellie Bly 10m Tug	<p>Sea Machines Robotics recently announced it will embark on a 1,000 nautical mile autonomous and remotely commanded journey around Denmark (September/October 2021)</p> <p>Transits will cover 3 VTS areas</p>	??	https://thedigitalship.com/news/electronics-navigation/item/7500-sea-machines-prepares-vessel-for-1-000-mile-autonomous-voyage	Dorte Hansen

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UK et al	MASS People MASS training and certification project	A MASS training and certification multilateral project led by UK maritime training company FUGRO aiming to develop standards for MASS operators and others and subsequently address the IMO with its findings.		https://www.fugro.com/media-centre/news/fulldetails/2021/02/18/fugro-launches-masspeople-international-working-group-for-remote-and-autonomous-training-standards	??